

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

**WEST**

Generate Collection

Print

L3: Entry 26 of 34

File: USPT

Feb 12, 1985

US-PAT-NO: 4499385

DOCUMENT-IDENTIFIER: US 4499385 A

TITLE: Recreational vehicle power control system

DATE-ISSUED: February 12, 1985

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Slavik; William H.	Palos Hills	IL		

## ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Nuvatec, Inc.	Downer's Grove	IL			02

APPL-NO: 06/ 515350 [PALM]

DATE FILED: July 19, 1983

INT-CL: [03] H02J 3/14

US-CL-ISSUED: 307/10R; 307/35, 307/39, 307/140

US-CL-CURRENT: 307/10.1; 307/140, 307/35, 307/39

FIELD-OF-SEARCH: 307/1R, 307/34, 307/35, 307/38, 307/39, 307/41, 307/126, 307/130, 307/131, 307/140, 307/141

PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

Search Selected

Search ALL

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<input type="checkbox"/>	<u>3603806</u>	September 1971	Hitzke	307/126
<input type="checkbox"/>	<u>4090088</u>	May 1978	McMahon et al.	307/38
<input type="checkbox"/>	<u>4336462</u>	June 1982	Hedges et al.	307/35
<input type="checkbox"/>	<u>4357665</u>	November 1982	Korff	307/35 X
<input type="checkbox"/>	<u>4421992</u>	December 1983	Hibbard et al.	307/41
<input type="checkbox"/>	<u>4446359</u>	May 1984	Arribas et al.	307/39 X

ART-UNIT: 214

PRIMARY-EXAMINER: Pellinen; A. D.

ASSISTANT-EXAMINER: Jennings; Derek

**WEST**

Generate Collection

Print

L3: Entry 26 of 34

File: USPT

Feb 12, 1985

US-PAT-NO: 4499385

DOCUMENT-IDENTIFIER: US 4499385 A

TITLE: Recreational vehicle power control system

DATE-ISSUED: February 12, 1985

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Slavik; William H.	Palos Hills	IL		

US-CL-CURRENT: 307/10.1; 307/140, 307/35, 307/39

## CLAIMS:

I claim:

1. A power control system for a recreational vehicle comprising means for receiving electrical current from a source of power characterized by a power voltage, a major electrically powered appliance, a plurality of additional electrically powered appliances, and means for connecting the major appliance and the additional appliances to the receiving means, said power control system comprising:

means for sensing the current drawn by the additional appliances from the receiving means;

means for generating a current threshold signal;

means for automatically disconnecting the major appliance from the receiving means when the second current exceeds the threshold signal; and

means for automatically reconnecting the major appliance to the receiving means at a selected time after the sensed current falls below the threshold signal;

said disconnecting means further comprising means for automatically disconnecting the major appliance from the receiving means when the power voltage falls below a first value; and

said reconnecting means further comprising means for automatically reconnecting the major appliance to the receiving means after the power voltage exceeds a second value, greater than the first value.

2. The invention of claim 1 further comprising means for delaying the selected time for a predetermined time period after the sensed current falls below the threshold signal to ensure that the major appliance remains disconnected by the disconnecting means from the receiving means for at least the predetermined time period.

3. The invention of claim 1 further comprising:

means for generating a visual display indicative of the amplitude of the power voltage.

4. The invention of claim 1 wherein the major appliance comprises a first air conditioner, wherein the recreational vehicle further comprises a second air conditioner, and wherein the invention further comprises means, included in the reconnecting means, for alternately connecting the first and second air conditioners to the receiving means to provide intermittent operation of both air conditioners while preventing both air conditioners from drawing power simultaneously.

5. A power control system for a recreational vehicle comprising means for receiving electrical current from a source of power characterized by a power voltage, a major electrically powered appliance, a plurality of additional electrically powered appliances, and means for connecting the major appliance and the additional appliances to the receiving means, said power control system comprising:

means for sensing the current drawn by the additional appliances from the receiving means;

means for generating a current threshold signal;

means for automatically disconnecting the major appliance from the receiving means when the sensed current exceeds the threshold signal;

means for automatically reconnecting the major appliance to the receiving means at a selected time after the sensed current falls below the threshold signal;

a plurality of discrete light sources; and

means, responsive to the power voltage, for controlling the light sources such that each of the light sources is illuminated when the power voltage is in a respective range of values, with a brightness indicative of the magnitude of the power voltage within the respective range.

6. In a recreational vehicle comprising means for receiving electrical current from a source of power characterized by a power voltage, a major electrically powered appliance, a plurality of additional electrically powered appliances, and means for electrically interconnecting the major appliance and the additional appliances to the receiving means, the improvement comprising:

a switch, included in the interconnecting means, for disconnecting the major appliance from the receiving means;

current sensor means for generating a current load signal indicative of the current drawn by the additional appliances from the source of power;

switch control means, responsive to the current load signal, for automatically controlling the switch to disconnect the major appliance from the receiving means when the current load signal enters a first range of values, and for automatically controlling the switch to reconnect the major appliance to the receiving means when the current load signal enters a second range of values, said first and second ranges of values chosen such that the major appliance is automatically removed from the source of power when the current to the additional appliances exceeds a maximum value before the combined current to the major and additional appliances exceeds a predetermined value characteristic of the source of power, and the major appliance is automatically reconnected with the source of power after the current to the additional appliances falls to a point where the combined current to the major and additional appliances is less than the predetermined value;

voltage sensor means for generating a voltage signal indicative of the magnitude of the power voltage; and

means, included in the switch control means, for automatically controlling the switch to automatically disconnect the major appliance from the receiving means when the voltage signal enters a third range of values, indicative of excessively low power voltage, and to automatically reconnect the major appliance to the receiving means after the voltage signal enters a fourth range of values, higher than the third range of values and indicative of normal power voltage.

7. The invention of claim 6 further comprising:

means for manually adjusting the first and second ranges of values between an upper set, suitable for a higher amperage source of power, and a lower set, suitable for a lower amperage source of power.

8. The invention of claim 7 wherein the upper set is suitable for a 30 amp source of power and the lower set is suitable for a 20 amp source of power.

9. The invention of claim 7 further comprising means for automatically resetting the first and second range of values to the lower set on initial power application to the switch control means.

10. The invention of claim 7 wherein the third range of values is indicative of power voltage less than about 95 VAC and wherein the fourth range of values is indicative of power voltage greater than about 105 VAC.

11. The invention of claim 7 further comprising:

means, included in the switch control means, for preventing the switch control means from controlling the switch to reconnect the major appliance until a predetermined time has elapsed since the control means has controlled the switch to disconnect the major appliance.

12. A control system for a recreational vehicle comprising means for receiving electrical current from a source of power characterized by a power voltage, a first electrically powered heat transfer appliance controlled by a first manual switch, a second electrically powered heat transfer appliance controlled by a second manual switch, a plurality of additional electrically powered appliances, and means for connecting the first and second heat transfer appliances and the additional appliances to the receiving means, the improvement comprising:

a first controller switch for selectively disconnecting the first heat transfer appliance from the receiving means;

a second controller switch for selectively disconnecting the second heat transfer appliance from the receiving means;

means for remotely sensing when the first manual switch is closed and for generating a first switch closure signal in response thereto;

means for remotely sensing when the second manual switch is closed and for generating a second switch closure signal in response thereto;

a controller, responsive to the first and second switch closure signals, and coupled to control the first and second controller switches;

means, included in the controller, for automatically cycling between closure of the first controller switch and closure of the second controller switch when both the first and second switch closure signals are present, thereby ensuring

that the first and second heat transfer appliances are not simultaneously connected to the receiving means;

means, included in the controller, for automatically closing one of the two controller switches when the corresponding one of the switch closure signals is present and the other of the switch closure signals is absent;

means for remotely sensing the power voltage and for generating a voltage signal in response thereto; and

means, included in the controller, for automatically opening the first and second controller switches when the voltage signal falls below a first voltage threshold indicative of excessively low power voltage, and for automatically returning control of the first and second controller switches to the cycling means and the closing means after the voltage signal rises above a second voltage threshold indicative of adequate power voltage.

13. The invention of claim 12 further comprising:

means for remotely sensing the current drawn by the heat transfer appliances and for generating a first current signal in response thereto; and

means, included in the cycling means and responsive to the first current signal, for initiating a cycle of the cycling means a selected time after the first current signal reaches a value indicative of current below a predetermined value in the one of the heat transfer appliances associated with the closed one of the controller switches.

14. The invention of claim 13 further comprising:

means for remotely sensing the current passing between the receiving means and the additional appliances and for generating a current load signal in response thereto; and

means, included in the controller, for automatically opening the first and second controller switches when the current load signal exceeds a first threshold value indicative of excessive current, and for automatically returning control of the first and second controller switches to the cycling means and the closing means when the current load signal falls below a second threshold value.

15. The invention of claim 14 further comprising:

means, included in the controller, for ensuring that a predetermined time delay is maintained between the time a selected one of the controller switches is opened and the time it is next closed.

## ABSTRACT:

A power management system for a recreational vehicle which operates automatically to disconnect a major electrical appliance, such as an air conditioner, heater or water heater, from power when the current drawn by additional appliances exceeds a preset current threshold. When the current drawn by these additional appliances falls below the threshold, the major appliance is automatically reconnected. A preferred embodiment operates to alternate between two or more air conditioners, heaters, or the like, to ensure that only one is connected to power at any given time, but that both are activated alternately and in sequence to provide efficient use of both air conditioners. In addition, preferred embodiments operate to interrupt operation of the air conditioners whenever the power voltage falls excessively low, and to ensure at least a preselected time delay between the time an air conditioner is stopped and restarted.

15 Claims, 10 Drawing figures